Joint Countermine Advanced Concept Technology Demonstration (ACTD) Summary

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The long-term goal of the JCM ACTD was to address the current capability gaps in the critical sea-to-land transition zone necessary to enable seamless movement during an amphibious operation and subsequent movement to contact with the enemy. Because clandestine reconnaissance had been highlighted as a critical need by various national countermine study panels, the ACTD sought to emphasize systems and Concepts of Operations (CONOPS) that support this identified need.

The JCM ACTD provided 13 pre-production systems to the warfighter for his assessment of military utility. The technologies and systems were selected because they were 1) judged to fulfill a critical countermine need, and 2) technologically mature enough so that their acquisition could be accelerated where they were judged by the warfighter to provide exceptional military value. Recognizing that these systems must be interoperable within an existing, legacy system of systems, an enhanced countermine Command, Control, Communications, Computers, and Intelligence (C4I) architecture was devised to ensure interoperability and that a common countermine tactical picture was provided to all levels of command. These novel systems, the enhanced C4I system, realistic play in two major exercises utilizing new concepts of operations, and the Joint Countermine Operational Simulation (JCOS) all worked together to present sufficient information to the United States Atlantic Command (USACOM) for the assessment of military utility.

At the inception of this ACTD in 1994, no countermine systems had been fielded since Desert Storm. A survey of developmental programs and technologies showed that near-shore and land systems were farther along than were water-side clandestine reconnaissance systems. Therefore, it was decided that Demo I would focus on the near-shore and land systems and would proceed in FY 97 as a dress rehearsal for the full capability demonstration in FY 98 (when all 12 systems would be available). One additional system, the Clausen Power Blade (PB), was added to the ACTD through Congressional action, and participated fully in both demonstrations.

This year, Fiscal Year 2000, was the final year for this ACTD. Presented below is a summary of the results of the two operational demonstrations, military utility analysis, residual period demonstrations, and the current status of the technologies that participated in the Joint Countermine ACTD.

SUMMARY OF DEMONSTRATIONS

Demonstration I

Demonstration I of the JCM ACTD was completed on 5 September 1997 as part of JTFEX 97-3. Nine novel countermine systems (4 reconnaissance systems and 5 breaching/clearing systems) as well as an enhanced C4I architecture and a sophisticated modeling and simulation tool participated in this demonstration alongside operational forces utilizing current countermine systems. At Camp Lejeune,

the amphibious assault took place at Onslow Beach. The beach landing area extended from Onslow South Tower to Riseley Pier, about 1 nautical mile of beachfront. The ACTD amphibious breach/assault was conducted against defenses emplaced at two landing areas. The beach south of South Tower was defended by a very shallow water (VSW) minefield and heavy mine/obstacle beach defenses, while the beach just south of Riseley Pier was defended by a separate, lighter mine/obstacle field. The VSW minefield contained a gap for the purpose of detection and exploitation by the assault planners, utilizing the novel systems and legacy systems/forces, as appropriate. Across the intracoastal waterway, in Training Landing Zone (TLZ) Bluebird and Exercise Training Area 2 (ETA-2), there were additional land minefields, including buried and surface-laid anti-tank (AT) and anti-personnel (AP) mines as well as off-route mines (ORMs) protecting anticipated assault force routes.

At Fort Bragg, the airfield seizure and lodgment establishment took place at Luzon drop zone at Camp Mackall. There were seven different minefields emplaced in the area on and around the Luzon drop zone. These fields incorporated metallic and low-metallic, buried and surface-laid, AT and AP minefields.

JTFEX 98-1 (JCM ACTD Supplemental Assessment)

With a goal of providing an opportunity of "supplemental assessment" relative to Demonstration I (JTFEX 97-3) of the JCM ACTD, two of the Army sponsored novel systems (ASTAMIDS and CIMMD), along with the Digital Reconnaissance System (DRS), a component of the C4I architecture, were provided for participation in JTFEX 98-1 which was conducted from 15 January 1998 to 4 February 1998 with Army operations at Fort Bragg, North Carolina.

The signature event of the exercise was "Operation Big Drop" which was conducted during the evening of 29 January. During this evolution, nearly 3,000 paratroopers from the 82nd Airborne Division parachuted into Holland and Sicily Drop Zones (DZ) at Fort Bragg. At Sicily DZ, the personnel jump at 2015 (local time) was preceded by a "heavy drop" at 2000 in which tens of HMMVWs and other heavy equipment/vehicles were parachuted from C-141 aircraft (A/C). In all there were 32 C-130 and 48 C-141 A/C involved in the drop.

This event, from a mine warfare perspective, was essentially a replay of the airfield takedown vignette of Demonstration I. Prior to the airborne assault, both Anti-Tank (AT) and Anti-Personnel (AP) minefields were emplaced. AT minefields consisted of two surface-laid minefields and a buried minefield at one DZ, one surface laid minefield on a Field Landing Strip (FLS) and a buried minefield in near proximity to this same FLS. A single APL minefield was emplaced along a dirt "center-line" roadway of the primary DZ.

Demonstration II

Demonstration II of the JCM ACTD was part of Maritime Combined Operations Training (MARCOT)/Unified Spirit 98. The exercise period spanned from 1 to 18 June 1998. The exercise geography was overlaid onto the Canadian province of Newfoundland. MCM operations took place in St. George's Bay in preparation for the amphibious assault onto the beaches at Stephenville, Newfoundland. The assault plan consisted of a simultaneous heli-borne and surface assault to seize the landing force objectives. Upon seizure of the landing force objectives, the amphibious task force assaulted Green Beach to seize the port and airfield and to allow introduction of follow-on forces.

Both the inner and outer Amphibious Operating Area, the VSW/SZ region, beach and inland areas were mined.

There were a total of 11 novel systems participating in this demonstration including 6 reconnaissance systems and 5 breaching/clearing systems. Additionally, the JCM ACTD-developed enhanced C4I architecture and the modeling and simulation component were included.

Residual Phase

A recommendation for the Residual Phase of the JCM ACTD was to take advantage of other venues to further demonstrate those systems not fully tested during the major demonstration phase of the JCM ACTD. Kernel Blitz 99 (KB99), conducted in the April 1999 time frame, was available and COMINEWARCOM sponsored the use of several novel systems (2 reconnaissance systems and 1 breaching/clearing system) by the MCMRON 3 staff during that exercise. The exercise period spanned from 5 to 24 April 1999. KB is a bi-annual Commander-in-Chief Pacific (CINCPAC) exercise focused on operational/tactical training of Commander, Third Fleet (C3F)/I Marine Expeditionary Forces (MEF) and Commander, Amphibious Group 3 (CPG-3)/1st Marine Division (MARDIV).

Mine Countermeasures (MCM) operations took place off Camp Pendleton primarily during the Advance Force Operations phase of the exercise in preparation for the amphibious assault of Red Beach. Only portions of the AOA geometry were populated with mines due to water depth limitations of the participating novel systems. Both moored and bottom mines were emplaced.

Although outside the purview of the JCM ACTD, Fleet Battle Experiment Hotel (FBE-H) provided an opportunity for additional operational demonstration of two JCM ACTD systems. FBE-H was the eighth in a series of CNO sponsored, Navy Warfare Development Command/Maritime Battle Center (NWDC/MBC) executed, experiments designed to examine future technologies and innovative operational concepts. FBE-H was conducted in the COMSECONDFLT AOR from 28 August until 12 September 2000. One of the key focuses of FBE-H was *assured access* in support of joint operations. Several ONR-sponsored Autonomous Underwater Vehicles (non JCM ACTD systems) participated as well as two novel systems from the JCM ACTD (LRS and Advanced Sensors).

NOVEL COUNTERMINE SYSTEMS; DESCRIPTION, MILITARY UTILITY ASSESSMENT, RESIDUAL PHASE ACTIVITIES AND RECOMMENDATIONS

The following tables are included to summarize this complex ACTD effort:

Table **1-CM** contains a brief description of each of the JCM ACTD novel systems; countermine task, technology utilized, and demonstration objectives. In addition, participation in JCM ACTD demonstrations, as well as residual phase activities, is listed for each novel system;

Table **2-CM**, developed by Joint Forces Command (JFCOM), formerly USACOM, depicts their military utility assessment for each of the JCM ACTD novel systems following Demonstration II of the JCM ACTD;

Table **3-CM** summarizes conclusions drawn from the demonstration phase of the JCM ACTD and, in addition, describes Residual Phase recommendations for each of the JCM ACTD systems; and

Table **4-CM** lists the current status/disposition of each of the novel systems as well as outstanding issues for each.

Table 1-CM NOVEL COUNTERMINE SYSTEMS

Novel System	Service	Countermine Task	Technology	Demonstration Objectives	JCM ACTD Demonstration Participation			Residual Phase Activities
					Demo I JTFEX 97-3	Supplemental Assessment JTFEX 98-1	Demo II MARCOT 98	
Littoral Remote Sensing	Navy	Clandestine Surveillance and Reconnaissance	National Technical Means (NTM) collection optimization, advanced algorithms for IR, Visible Imaging Sensors	Detect/locate shallow water and beach minefields and obstacles as well as delineate METOC, topographic, and bathymetric parameters	X		X	KB-99 FBE-H
Near-term Mine Reconnaissance System	Navy	Low Observable Reconnaissance	SSN hosted Unmanned Underwater Vehicle with multi-beam, active search sonar and side-scan classification sonar.	Minefield reconnaissance in deep and shallow water.			X	

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					Demo I JTFEX 97-3	Supplemental Assessment JTFEX 98-1	Demo II MARCOT 98	
Advanced Sensors	Navy	Low Observable Reconnaissance	Remote Minehunting System-hosted sensor suites: deep-water package; toroidal volume search sonar, shallow water package; synthetic aperture sonar and laser line scan camera[1].	Detection/Classification of deep water mines, Detection, classification and identification of shallow water mines.			X[2]	KB-99 FBE-H[3]
Magic Lantern (Adaptation)	Navy	Overt Reconnaissance[4]	Unmanned Aerial Vehicle (UAV)-hosted gated LIDAR imaging for detection of minefields and obstacles.	Detect, classify and localize minefields and obstacles in the VSW, surf zone and craft landing zone.	X		X	

[1] Also referred to as Electro-Optic Identification (EOID).
[2] TVSS (Deep Water) sensor.
[3] EOID/SAS (Shallow Water) sensor for both KB-99 and FBE-H.
[4] All 3 of the Overt Reconnaissance systems (ML(A), COBRA, and ASTAMIDS) were planned for eventual incorporation into a UAV platform. All flew on surrogate, piloted aircraft for the demonstrations.

Novel System	Service	Countermine Task	Technology	Demonstration Objectives	JCM ACTD Demonstration Participation			Residual Phase Activities
					Demo I JTFEX 97-3	Supplemental Assessment JTFEX 98-1	Demo II MARCOT 98	
Coastal Battlefield Reconnaissance and Analysis	USMC	Overt Reconnaissance	UAV-hosted multi-spectral optical sensor system.	Detection of minefields/obstacles in the beach/CLZ with potential inland applicability.	X		X	
Airborne Standoff Minefield Detection System	Army	Overt Reconnaissance	UAV-hosted passive infrared technology.	Detect and identify the boundaries of patterned and scatterable, metallic and nonmetallic, surface and buried, anti-tank minefields.	X	X	X	
Advanced Lightweight Influence Sweep System	Navy	Breaching	Unmanned surface craft, super-conducting magnet and plasma discharge pulse power technology.	Magnetic and acoustic influence sweep for assault craft prior to amphibious landing/assault.			X	KB-99

Novel System	Service	Countermine Task	Technology	Demonstration Objectives	JCM ACTD Demonstration Participation			Residual Phase Activities
					Demo I JTFEX 97-3	Supplemental Assessment JTFEX 98-1	Demo II MARCOT 98	
Joint Amphibious Mine Countermeasures	USMC	Follow-on Clearance	Remotely controlled tractors with multifunctional land MCM systems (mechanical, explosive, and magnetic, marking subsystems).	Clearance of mines and light obstacles from the high-water mark through the Craft Landing Zone (CLZ).	X			
Off-Route Smart Mine Clearance	Army	Clearing	Tel-operated HMMWV with acoustic, seismic, and IR decoy designed to emulate tank signatures.	Neutralize off-route smart (anti-tank) mines.	X			
Power Blade	USMC[5]	Breaching, Follow-on Clearance	High power belt-driven conveyer blade.	Clearance of heavy obstacles and AT/AP mines for breach lanes and CLZs.	X[6]		X[7]	Explosive survivability testing

[5] Participation of the Power Blade in the JCM ACTD was congressionally mandated.
[6] D8 variant.
[7] D8 and D7 variants.

Novel System	Service	Countermine Task	Technology	Demonstration Objectives	JCM ACTD Demonstration Participation			Residual Phase Activities
					Demo I JTFEX 97-3	Supplemental Assessment JTFEX 98-1	Demo II MARCOT 98	
Explosive Neutralization (Advanced Technology Demonstration)	Navy	Breaching	Explosive net-array (Surf Zone Array) and Line Charges plus Fire Control System (FCS).	Beach approach lane clearance, VSW and SZ. (FCS Only).	X		X	Subsystem deployment accuracy summary report[8]
Army Classified Program	Army	Breaching	ACP withdrawn from JCM ACTD					
Close-In Man Portable Mine Detector	Army	Clearing	Hand-held ground penetrating radar, metal detection and standoff Thermal (IR) Imager (IR in Demo I only).	Detect metallic and non-metallic antitank (AT) and anti-personnel (AP) mines.	X	X	X	
Joint Countermine Application	Joint	C4I	MCM-tailored C4I system.	Provide up to date JCM common tactical/operational picture.	X		X	KB-99

[8] Only the FCS was demonstrated during Demonstrations I and II.

Novel System	Service	Countermine Task	Technology	Demonstration Objectives	JCM ACTD Demonstration Participation			Residual Phase Activities
					Demo I JTFEX 97-3	Supplemental Assessment JTFEX 98-1	Demo II MARCOT 98	
JCOS	Joint	M&S	Distributed M&S, with connectivity to JCA, to support warfare training, mission and operational support.	Provide operational planning and evaluation.	X		X	KB-99

Table 2-CM MILITARY UTILITY ASSESSMENT OF JCM ACTD NOVEL SYSTEMS

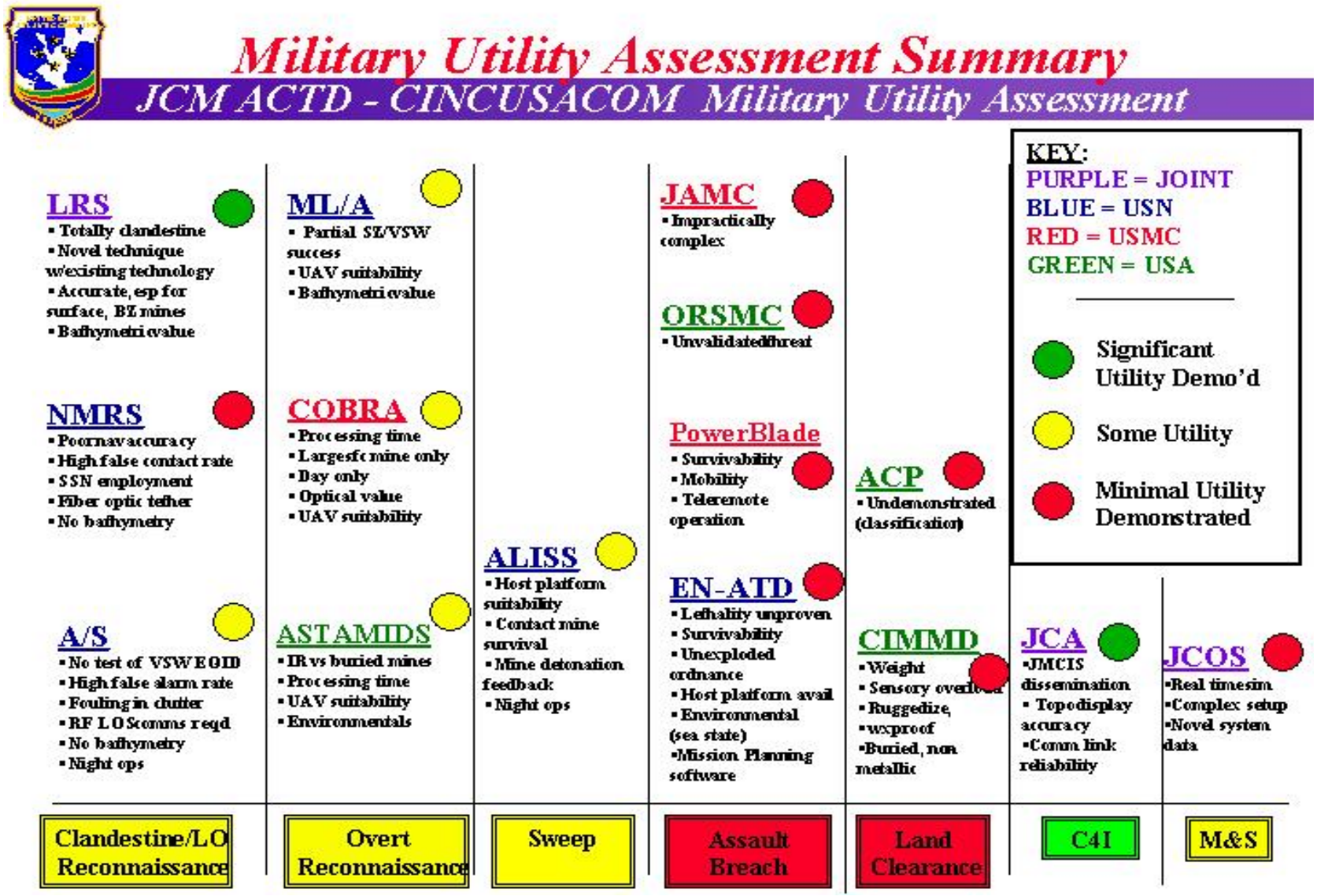

Table 3-CM SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Task	Novel System/Technique	Conclusions	Residual Phase Recommendations
Clandestine Reconnaissance	**Littoral Remote Sensing (LRS)**	LRS products were useful in support of assault planning. The imagery and associated line drawings established a valuable baseline of information on beach topography and defenses. The unclassified line drawings were particularly useful as product easily disseminated to SEAL and other elements working the surf and beach zones.	The LRS techniques developed should be institutionalized in tactics, techniques and procedures and in formal service and joint training. As a first step in the post-demonstration phase of the ACTD, the draft Beach Book and Analysts Guide should be finalized for review by operational and intelligence subject matter experts. Following that, the LRS techniques should be incorporated in service and joint training that reinforces the application of national reconnaissance assets against the mine problem in the littoral. USACOM proposes that Commander Amphibious Group Two in coordination with the USACOM J2, Atlantic Intelligence Command and other USACOM components take the lead in the near term review of documentary products.
Low Observable Reconnaissance	**Near Term Mine Reconnaissance System (NMRS)**	Whatever the program's original employment concept or its potential in scenarios other than the JCM ACTD, NMRS did not demonstrate utility in precursor reconnaissance to the MARCOT amphibious assault. The system may have utility in confirming the presence of a minefield but lacking a more precise location of individual mines added little value to the follow-on hunting and clearance operations and, in fact, delayed that effort with a high volume of false contacts.	There should be no further demonstration of NMRS in the JCM ACTD context (MCM support of operational maneuver from deep water to amphibious assault) until a concept of employment has been developed and validated defining the appropriate role and tasking relationships for NMRS. Additionally the navigational accuracy of the system must be substantially improved before any follow-on demonstration of NMRS interoperability with legacy mine countermeasure systems would be useful. USACOM proposes that Commander Mine Warfare Command, in coordination with other components and NMRS program management, lead a review of the NMRS employment issues surfaced during the JCM ACTD.
	Advanced Sensors (AS)	The employment of AS, while indicating some potential utility, leaves several major issues unresolved including deployability and the high false alarm rate. The EOID capability unfortunately has not been demonstrated and significant sensor operation and platform engineering issues remain unresolved; notably the fouling of the system by fishing gear and other clutter normally encountered in the littoral.	The shallow water package, including the EOID should be demonstrated in an environment that clearly establishes AS interoperability with legacy mine countermeasures as soon as possible. Any follow-on demonstration should propose solutions to the observed TVSS high false alarm rate and fouling of the remotely operated vehicle and towbody by fishing gear and other anticipated littoral clutter. USACOM proposes that Commander Mine Warfare Command take the lead in identifying an appropriate follow-on demonstration venue.

Task	Novel System/Technique	Conclusions	Residual Phase Recommendations
Overt Reconnaissance	**Magic Lantern (Adaptation) (ML(A))**	The ML(A) product was clearly useful in selecting beach centers and assault breach planning. The ML(A) bathymetric product was particularly valuable to planners.	The assessment of this airborne reconnaissance system should continue the resolution of its deployability on a UAV and development of a tactical decision aid for employment in varied environments. The ML(A) sensor should be considered for the ALMDS program.
	Coastal Battlefield Reconnaissance and Analysis (COBRA)	Though COBRA has been deployed on a current UAV platform (outside of the ACTD) and demonstrated some reconnaissance capability beyond its expected MCM performance, its detection and processing capability requires substantial improvement on the very limited utility demonstrated to date.	The assessment of this airborne reconnaissance system should continue when ready to demonstrate substantial reduction of processing complexity/time while jointly moving toward an integrated sensor payload for deployment on a common UAV platform. The JCM ACTD experience reinforces the integration goals set forth in the recently proposed Defense Technical Objective.
	Airborne Standoff Minefield Detection System (ASTAMIDS)	Significantly, ASTAMIDS alone among the ACTD's airborne reconnaissance systems demonstrated some effectiveness in detection of buried landmines. As with the other systems, significant sensor operation and processing issues remain unresolved as well as ASTAMIDS deployability on the intended UAV platform.	The assessment of this airborne reconnaissance system should continue when ready to demonstrate substantial reduction of processing complexity/time while jointly moving toward an integrated sensor payload for deployment on a common UAV platform. The JCM ACTD experience reinforces the integration goals set forth in the recently proposed Defense Technical Objective.
Influence Sweep	**Advanced Lightweight Influence Sweep System (ALISS)**	The demonstrated ALISS magnetic and acoustic sweep technology is an impressive glimpse of the system's potential to counter influence mines. Deploying the technology on an acceptable platform presents a significant challenge.	The assessment of this sweep system should continue when ready to demonstrate improvement of the subsystems' reliability and the feasibility of deploying ALISS on a suitable remotely controlled platform.
Beach approach lane clearance	**Explosive Neutralization (Advanced Technology Demonstration) (EN-ATD)**	The essence of this breaching system is its explosive subsystems that have not been demonstrated in the ACTD. Despite the challenges of such an event, a complete demonstration under the most realistic operational conditions achievable is fundamental to the system's assessment.	Further assessment of the system should await EN-ATD readiness and the appropriate venue to demonstrate the complete operational sequence and lethality of the explosive subsystems against a representative threat.
Mine and heavy obstacle clearance	**Clausen Power Blade (PB)**	PB mounted on a bulldozer is slow, heavy, difficult to transport and, in its teleremoted configuration, very challenging to operate even under relatively benign conditions. The vulnerability of the system, particularly the soil moving conveyor belt, to mine detonation remains unknown. As currently configured the system's utility, certainly in a breaching role, is minimal.	No further assessment of the system on its demonstrated host platform (D7/D8 Bulldozer) is warranted in the context of JCM ACTD operational tasking (amphibious assault breach/clear).
Off route smart mine decoy	**Off Route Smart Mine Clearance System (ORSMC)**	Though demonstration of ORSMC was very limited, major suitability issues are evident and the employment concept requires validation.	No further demonstration of this breaching/clearance system is recommended.
Beach assault	**Joint Amphibious Mine**	Though briefly demonstrated in Demo I, JAMC	No further demonstration of this breaching/clearance

Task	Novel System/Technique	Conclusions	Residual Phase Recommendations
lane clearance	**Clearance System (JAMC)**	clearly proved too complex to be effective on even a lightly defended beach.	system is recommended.
Metallic and non-metallic mine detection	**Close-in Man Portable Mine Detector (CIMMD)**	The system offered little enhancement of the current capability and is burdened with significant operator suitability issues.	No further demonstration of this man portable detection system in its ACTD configuration is recommended.
Common MCM Operational Display (C4I)	**Joint Countermine Application (JCA)**	The JCA was clearly a useful enhancement of the current C^4I presentation for planning purposes. Network and operator demands are significant but manageable.	Development should continue to include the capacity to support planning of land operations to complement the existing maritime JCA capability. The development of JCA and MEDAL should be integrated and USACOM proposes that Commander Amphibious Group Two and Commander Mine Warfare Command take the lead in the operational input to this process. JCA should be proposed for DISA certification. Residual phase exercise and contingency applications should be identified and executed.
Modeling and Simulation	**Joint Countermine Operational Simulation (JCOS)**	The JCOS, as demonstrated, is not ready to be placed in the hands of warfighters for general course of action analysis under operational conditions. When supported by an experienced technical team, the system may be useful in staff training events or analysis of narrowly defined operational issues.	As currently configured JCOS should be made available to transition to service and joint trainers.

Table 4-CM NOVEL SYSTEM STATUS

Novel System	Current Status	Outstanding Issues
LRS	*Transitioned capability and continued exercise participation.*	Continued exercise participation is highly recommended as this will result in increased familiarity of the capability to the military user. Unclassified products are highly regarded but the user must be aware of LRS capability/availability.
NMRS	*Effort restructured for LMRS risk reduction.*	Continued CONOPS development for LMRS in the context of supporting amphibious operations is required. For LMRS, navigation and positional uncertainty, and high false alarm rate need to be addressed. Launch and recovery from a tactical platform needs to be demonstrated.
AS	*TVSS development terminated EOID/SAS continued test & development.*	Ultimate packaging of the SAS and EOID sensors. There are questions as to whether a remotely operated vehicle can maneuver with sufficient precision to ID contacts even with the swath associated with a 25-foot altitude. The fully functional EOID sensor should be demonstrated again to determine whether reacquisition could be accomplished without steering over the contact. SAS sensor should be assessed against buried mines.
ML(A)	*Technology/operational lessons learned applied to ALMDS (proposed).*	Integration of the eventual ALMDS system into the CH-60 aircraft. A TDA to predict performance based on water clarity would also be recommended.
COBRA	*Transitioned Program – P3I.*	Transitioned COBRA/P3I address all major JCM ACTD/COBRA issues. Verification of these improvements should be verified. SZ/VSW capabilities need to be assessed and quantified including environmental effects.
ASTAMIDS	*Terminated as Army program, continued R&D, possible technology transfer to COBRA/P3I.*	Possible incorporation of IR technology into the COBRA/P3I should be investigated.
ALISS	*Technology transitioned to OASIS program (proposed).*	Recent CH-60 testing has been successful in towing AQS-20X (mine-hunting sonar). Reduction of ALISS technology is required for the OASIS program since the CH-60 is the envisioned organic tow-platform for OASIS. The original concept for ALISS (unmanned surface influence sweep) might be viable with this same size reduction since host-platform size was the key suitability issue for ALISS.
JAMC	*Terminated.*	Although JAMC was unsuccessful the need to conduct Craft Landing Zone clearance is still a requirement for follow-on amphibious operations.
ORSMC	*Terminated.*	The concept for ORSMC might be more viable in a different scenario. While not

Novel System	Current Status	Outstanding Issues
		very successful in an assault role, ORSMC capability might be valuable for longer-term commitments of heavy US forces, of course, dependant on the threat.
Power Blade	*Terminated.*	While lacking mobility and with serious deployability/lift issues Power Blade (PB) did not demonstrate sufficient military utility for continuation as a program. Arguably, the PB does provide an enhancement over current legacy heavy clearance capability.
EN(ATD)	*DET/SABRE program (precursor to EN) terminated.*	Recently (October 19, 2000) a Congressional letter urged CNO to "reconsider the strong merits of SABRE and DET and maintain the funding required to complete the development and acquisition of these important mine warfare programs."
ACP	Withdrawn from ACTD	
CIMMD	*Transitioned to HSTAMIDS.*	Several suitability issues of CIMMD have been addressed with the HSTAMIDS program. Performance enhancements, the major push for HSTAMIDS improvements over CIMMD, need to be verified.
JCA	*Capability incorporated into MEDAL Build 7.0*	As MIW becomes more fleet-centric, MEDAL must also become more accessible and useable to the fleet operator.
JCOS	*Components transitioned to JSAF, continued exercise participation.*	An improved user interface and reduced infrastructure, relative to the JCM ACTD version of JCOS, is desired.

In summary, four JCM ACTD systems have successfully transitioned as acquisition programs (JCA/MEDAL 7.0, JCOS/JSAF, COBRA/P3I, and LRS). Several systems, although not being transitioned as whole entities, have transitioned technologies for ongoing/continued development. These include ML(A), ASTAMIDS, CIMMD, ALISS, AS (SAS/EOID), and NMRS. In addition to the technology transfer there are operational lessons learned. Systems that were terminated following JCM ACTD activities include Power Blade, JAMC, AS/TVSS, and ORSMC. With recent congressional interest in the EN(ATD) precursor programs (SABRE and DET) the ultimate status of EN(ATD) is indeterminate.

Although the JCM ACTD has had some transition success, the principle value has been to support a refocusing of effort for many of the systems and technologies that will, ultimately, produce a better product with better performance and better suitability to the military user.

The JCM ACTD has contributed in a significant way to the stated requirement for organic mine warfare success which is that mine warfare must be mainstreamed throughout the Navy. As examples, Demonstration I was the first time that the TACMEMO "Amphibious Operations in a Mined Environment" was executed in a live exercise, and Demonstration II (MARCOT 98) was one of the, if not the, largest multinational maritime exercises ever conducted with Mine Warfare as a primary focus. Although the mine warfare play within JTFEX 98-1 (JCM ACTD supplemental assessment) was not nearly as central as during MARCOT 98, it was nonetheless significant that this exercise "Purple Dragon/Operation Big Drop" did include a Mine Warfare component.

The JCM ACTD may also serve, in part, as a model for the Future Naval Capabilities (FNC) concept. In particular, the lessons learned from the JCM ACTD experience should contribute to the success of the FNC. Such lessons learned include that early fleet involvement is critical to success. This is to ensure that the warfighter understands a developing system's functionality and can, therefore, develop or contribute to the development, of appropriate CONOPS. There is a need to understand/quantify current capability across MIW tasks in order to assess the marginal utility of proposed systems. The use of existing M&S capabilities is recommended if at all possible. And finally, the value of live system play was demonstrated. This reveals many non-modeled and unanticipated phenomena, critical to understanding the utility of new systems with insights into environmental effects, training deficiencies, and communications limitations, all of which may contribute to the effectiveness and utility of countermine systems.